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First Named Inventor	Rodney C. Langley
Group Art Unit	1765
Examiner Name	M. Anderson
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ENCLOSURES (*check all that apply*)

- [ ] Fee Transmittal Form
  - [ ] Fee Attached
- [ ] Amendment/Reply
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  - [ ] Affidavits/declaration(s)
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Request for Reconsideration

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

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Date	May 6, 2002

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Docket No.: M4065.0018/P018-A
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Rodney C. Langley, et al.

Application No.: 09/507,465

Group Art Unit: 1765

Filed: February 22, 2000

Examiner: M. Anderson

For: METHOD AND APPARATUS FOR PLASMA ETCHING A WAFER

REQUEST FOR RECONSIDERATION

Commissioner for Patents
Washington, DC 20231

Dear Sir:

Responsive to the Office Action dated February 5, 2002 (Paper No. 11), please reconsider the above-identified U.S. Patent application in light of the following remarks.

Claims 10, 12-16, and 26 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 5,460,684 to Saeki et al. (hereinafter "Saeki") in view of U.S. Patent No. 4,902,531 to Nakayama et al. ("Nakayama"). The Office Action asserts, *inter alia*, that "a person having ordinary skill in the art at the time of the claimed invention would have found it obvious to modify Saeki et al. by using a rotating susceptor, as disclosed by Nakayama et al., because it would have been anticipated to produce an expected result of a plasma etching method." The Office Action also asserts that "the modification of the bore of Saeki et al. to fit the shaft of Nakayama et al. would have been within the knowledge of one of ordinary skill in the art in light of Nakayama et al.'s central

rotation shaft," and that "[t]he coolant of Saeki et al. could, in such a combination, travel only upward to the pedestal through the shaft."

For all of the reasons stated in Applicants' previous responses, and for the reasons stated below, the rejection of claims 10, 12-16, and 26 under § 103(a) as being unpatentable over Saeki in view of Nakayama is respectfully traversed. The combined disclosures would not have rendered obvious the embodiments of the method defined by any of claims 10, 12-16, and 26.

Applicants' claim 10 recites, *inter alia*, "coupling a chuck to a rotatable pedestal, the pedestal comprising a central bore having a hollow shaft disposed therein, **the chuck and the pedestal cooperating to define a coolant chamber in fluid communication with the hollow shaft**," "rotating the pedestal so as to rotate the coupled wafer," and "plasma etching the rotating wafer **while cooling the chuck by communicating a coolant through the hollow shaft to the coolant chamber**" (emphasis added).

The claimed invention would not have been obvious because there is no suggestion or motivation, either in the references or in the knowledge generally available to one of ordinary skill in the art, to combine the reference teachings as asserted to attain the claimed invention. Furthermore, even if the references were combined as asserted in the Office Action, the combined disclosures would not result in the claimed invention.

Saeki is directed to a plasma etching apparatus. Saeki's apparatus is not rotatable. To cool the wafer during etching, Saeki employs a cooling block 21 "at the

center of the bottom portion of the process chamber 1 via an insulator 16" (Saeki column 3, line 67, through column 4, line 1). Saeki describes the cooling block (see Fig. 1) as follows:

> In the cooling block 21, a bore 22 is formed for the purpose of circulating a coolant such as liquid nitrogen. An introduction tube 22a and an exhaustion tube 22b are connected to the bore 22, and the cooling liquid is supplied into the bore 22 via the introduction tube 22a, and is exhausted to the outside of the process chamber 1 via the exhaustion tube 22b. (Column 4, lines 4-10)

Thus, Saeki employs a <u>liquid</u> coolant, and introduces the liquid coolant to the cooling block through an introduction tube 22a, and removes the liquid coolant through an exhaustion tube 22b.

Nakayama is directed to "a method of and an apparatus for processing substrates in [a] vacuum chamber" (column 1, lines 7-9). Nakayama's method of processing employs an apparatus that is rotatable. To cool the wafer during processing, Nakayama employs a "cooling water feeding device 45" (column 5, lines 52-53). Nakayama describes the cooling system (see Fig. 5) as follows:

> The lower end portion of the rotating shaft 19 is passed through the opening 27a of the lower mounting plate 27 and is connected to a cooling water feeding device 45 which may be a rotary union and from which cooling water is fed through a feed channel of the rotating shaft 19 and flows out of the rotating shaft 19 through a return channel thereof. The electrode body 12 is provided with a separated cooling water supply which is not shown. (Column 5, lines 50-58)

Thus, Nakayama also employs a liquid coolant, and introduces the liquid coolant through a feed channel of the rotating shaft 19, and removes the liquid coolant through a return channel.

As indicated above, the Office Action asserts that it would have been "obvious to modify Saeki et al. by using a rotating susceptor, as disclosed by Nakayama et al., because it would have been anticipated to produce an expected result of a plasma etching method."

Applicants respectfully disagree. Even if the references were combined as asserted in the Office Action, the combined disclosures would not result in the claimed invention. Saeki discloses a non-rotating, liquid-cooled, plasma etching apparatus. Nakayama discloses a rotating, liquid-cooled, processing apparatus. Aside from employing a rotating susceptor, the disclosure of Nakayama adds nothing to remedy the deficiency associated with Saeki.

Nakayama does not even describe the destination of the cooling water that is fed through the feed channel. The reference instead discloses that the "cooling water is fed through a feed channel of the rotating shaft 19 and flows out of the rotating shaft 19 through a return channel thereof." There is no description of any structural element analogous to Saeki's cooling block, let alone Applicants' claimed "coolant chamber in fluid communication with the hollow shaft." It is unclear, therefore, as to how the method of routing cooling water described in Nakayama would cool a wafer. In addition, Nakayama discloses that the electrode body beneath the wafer is cooled by a different source of

cooling water, i.e., "[t]he electrode body 12 is provided with a separated cooling water supply which is not shown."

Applicants further respectfully submit that the Office Action's assertion that "[t]he coolant of Saeki et al. could, in such a combination, travel only upward to the pedestal through the shaft" is not only illogical, but serves to illustrate that the claimed invention would not have been obvious. In the asserted combination, the coolant of Saeki would <u>not</u> "travel only upward to the pedestal through the shaft." The Office Action relies upon Nakayama, and Nakayama discloses that the "cooling water is fed through a feed channel of the rotating shaft 19 and <u>flows out of the rotating shaft 19 through a return channel thereof</u>" (emphasis added). Thus, the cooling water would <u>not</u> travel only upward through the shaft.

Applicants' claimed method is different from the method that would result from the combination of disclosures that is asserted in the Office Action. Applicants' claimed method includes not only "coupling a chuck to a rotatable pedestal, the pedestal comprising a central bore having a hollow shaft disposed therein, **<u>the chuck and the pedestal cooperating to define a coolant chamber in fluid communication with the hollow shaft</u>**," but "plasma etching the rotating wafer **<u>while cooling the chuck by communicating a coolant through the hollow shaft to the coolant chamber</u>**."

Applicants can cool the chuck "by communicating a coolant through the hollow shaft **<u>to the coolant chamber</u>**" because Applicants' method is directed to plasma etching and employs a <u>gaseous</u> coolant. See, for example, Applicants' background description of

"conductive cooling of the backside of the chuck through the use of helium" (Background portion of specification, page 2, lines 20-21), and clamping the wafer to the chuck "[t]o contain the helium at the chuck and prevent it from escaping into the reaction" (specification, page 2, lines 24-26). At specification page 10, line 23, through page 11, line 4, Applicants describe the use of a gaseous coolant (helium) in the method of the invention, and disclose that the "lift rod 102b conveys helium to the coolant chamber 100 and the slots 16a." Thus, Applicants claim the step of "communicating a coolant through the hollow shaft to the coolant chamber." The asserted combination of Saeki and Nakayama fails to suggest the claimed method.

There is neither a suggestion nor a motivation in the asserted combination (each reference of which employs a liquid coolant) to derive the method defined by Applicants' independent claim 10. Thus, the asserted combination would not have rendered obvious the method defined by Applicants' claim 10.

Rejected dependent claims 12-16 and 26 are allowable along with claim 10, and on their own merits. For example, regardless of the assertion in the Office Action that "a person having ordinary skill in the art . . . would have found it obvious to control the process parameters" defined in claim 15, there is, for all of the reasons outlined above, no suggestion in either Saeki or Nakayama to combine reference teachings so as to arrive at the method of plasma etching as defined in Applicants' independent claim 10. Addition of the step of initializing process parameters as defined by claim 15 simply contributes even further to the unobviousness of the claimed invention.

For at least the above reasons, reconsideration and withdrawal of the rejection of claims 10, 12-16, and 26 under § 103(a) are respectfully requested.

In view of the above, each of the claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

Dated: May 6, 2002

Respectfully submitted,

By__________

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